KAUFMANN

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

IN THE MATTER OF THE REVISION OF RATES

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BOSTON GAS COMPANY
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Exhibit KEDNE/LRK-1

Direct Testimony

of

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Concerning Performance-Based Regulation

I. *INTRODUCTION*

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Lawrence R. Kaufmann. My business address is 22 East Mifflin, Suite 302, Madison, WI, 53705.

Q. WHAT IS YOUR POSITION AND RESPONSIBILITIES?

A. I am a Partner at Pacific Economics Group LLC ("PEG"). My work includes designing and providing empirical support on performance-based regulation (PBR) plans for energy utility clients. My specific duties include supervising research on the productivity and input price trends of utility industries, benchmarking utility cost performance, designing service quality PBR and other types of PBR plans, and expert witness testimony. I have been involved in projects measuring input price and productivity trends for a large number of gas and electric utility clients.

Q. WHAT IS YOUR PROFESSIONAL AND EDUCATIONAL BACKGROUND?

A. Prior to co-founding the Madison office of PEG in 1998, I was employed from 1993 until 1998 as a Senior Economist at Christensen Associates, an economic consulting firm based in Madison. I received a PhD in Economics from the University of Wisconsin in 1993.

Q. HAVE YOU EVER TESTIFIED BEFORE?

A. Yes. I have filed testimony on PBR issues, including service-quality PBR, in Rhode Island, Kansas, Hawaii, Oklahoma, Kentucky, and the Australian state of Victoria. I have also co-authored reports that were attached to PBR testimony in Massachusetts, California, and British Columbia.

Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?

A. This testimony will recommend an appropriate value for the "X factor" in an updated PBR plan for Boston Gas (the Company). Boston Gas operated under an index-based PBR plan that expired in November 2002. This PBR plan constrained the growth in the Company's maximum gas distribution rates by a GDP-PI minus X formula. The previous X factor for the Company had three components: a productivity differential, an

inflation differential, and a consumer dividend. This testimony will provide empirical evidence on the appropriate values for each of these components and, therefore, for the overall X factor.

Q. CAN YOU BRIEFLY SUMMARIZE YOUR CONCLUSIONS?

A. Yes. Based on my empirical research, the overall X factor for Boston Gas should be no greater than -0.2%. This figure is comprised of a -0.45% productivity differential, a 0.1% inflation differential, and a consumer dividend of 0.15%.

Q. HOW IS THE TESTIMONY ORGANIZED?

A. Following this introduction, the testimony is organized in six sections. Section II discusses the conceptual framework for choosing appropriate X factors. Section III discusses my research on total factor productivity ("TFP") trends for the Northeast gas distribution industry. Section IV presents information on productivity trends for the U.S. economy. Section V presents information on input price trends for the gas distribution industry and the US economy. Section VI discusses appropriate values for a consumer dividend in the Company's updated PBR plan. Section VII presents concluding remarks.

II. CONCEPTUAL FRAMEWORK FOR SELECTING X FACTORS

Q. IN GENERAL TERMS, PLEASE DESCRIBE THE PREVIOUS PBR PLAN FOR BOSTON GAS.

A. The Company was subject to an index-based form of PBR where the maximum annual escalation in its gas distribution rates was capped by a price-cap index (PCI) formula. The PCI constrained the overall growth in the Company's gas distribution rates, but Boston Gas was allowed to rebalance its rates provided that an index of its prices stayed within the PCI cap. In the PBR plan proposed by the Company in this proceeding, the Company seeks the same flexibility to rebalance rates by retaining discretion as to how it will apply the allowed change in the PCI within a class while ensuring that no rate component increases by more than the rate of inflation, as provided for in Boston Gas Company, D.T.E. 96-50 (Phase I), at 333-334.

Q. PLEASE DESCRIBE THE PREVIOUS PRICE CAP INDEX.

A. The growth rate in the Company's previous PCI was defined by the following formula:

$$PCI_t / PCI_{t-1} - 1 = \left(P_t / P_{t-1} - 1 \right) - X + Z_t .$$

Here, the term P_t is an inflation factor. The Company's previous inflation factor was the chain-weighted gross domestic product price index ("GDP-PI"). The term X is called the X factor. The term Z_t is called the Z-factor, which can reflect the impact of certain exogenous factors that affect the Company's unit cost but are not reflected in the inflation or X factors. For example, changes in accounting rules, taxes, low income programs, demand-side management, and the mandated replacement of cast iron and bare steel main could qualify for Z-factor adjustments.

Q. WAS A FORMULA FOR THE X FACTOR SPECIFIED FOR BOSTON GAS IN THE PREVIOUS PBR PLAN?

A. Yes. At the time the Company's previous PBR plan expired, its X factor was defined by the following formula:

$$X = \left(TFP^{IND} - TFP^{US} \right) + \left(W^{US} - W^{IND} \right) + CD$$

In this formula, TFP^{IND} represents the TFP trend for the gas distribution industry, TFP^{US} represents the TFP trend for the US economy, W^{IND} is the input price trend for the gas distribution industry, W^{US} is the input price trend for the US economy, and CD is the consumer dividend. The difference (TFP^{IND} - TFP^{US}) is referred to as the productivity differential, while the difference (W^{US} – W^{IND}) is referred to as the inflation differential. Therefore the previous X factor for Boston Gas was the sum of three components: the productivity differential, the inflation differential, and the consumer dividend.

Q. IS THIS X-FACTOR FORMULA CONSISTENT WITH THE APPROPRIATE CONCEPTUAL FRAMEWORK FOR SELECTING X FACTORS?

A. In general, yes. Economists believe that a well designed price cap plan should conform to what is sometimes referred to as the "competitive market paradigm." The competitive market paradigm reflects the concept that PCIs in price-cap plans should be calibrated so

that they grow at the same rate that prices would be expected to grow in competitive markets. If a PCI uses an economy-wide measure of inflation like the GDP-PI as an inflation factor, the formula for the X factor in effect at the end of the Company's previous PBR plan is consistent in principle with the competitive market paradigm.

Q. PLEASE EXPLAIN.

A. This result is best explained by considering how prices evolve in competitive markets. If an industry earns a competitive rate of return in the long run, the trend in industry prices will equal the industry's trend in unit costs.

$$trend\ Output\ Prices^{Industry} = trend\ Unit\ Cost^{Industry}. \quad [1]$$

It can be shown that the trend in an industry's unit cost is the difference between trends in its input price index and its TFP index.

$$trend\ Unit\ Cost^{Industry} = trend\ Input\ Prices^{Industry} - trend\ TFP^{Industry}. \quad [2]$$

Boston Gas has proposed using the GDP-PI as an inflation factor. If the trend growth in GDP-PI is both added and subtracted from the right hand side of equation [2] above, this equation is unchanged. Doing so yields the following formula:

$$trend\ Unit\ Cost^{Industry} = trend\ GDPPI - \left[\begin{array}{l} trend\ TFP^{Industry} \\ +\left(trend\ GDPPI - trend\ Input\ Prices^{Industry}\right) \end{array}\right] \quad [3]$$

The items in the bracketed term can be further examined by recognizing that the GDP-PI is a measure of *output* price inflation in the overall economy. Given the broadly competitive structure of our economy, the same indexing logic detailed in equations [1] and [2] will also apply to the measures of economy-wide output price inflation. This logic implies that the long-run trend in GDP-PI is the difference between the trends in input price and TFP indexes for the economy.

$$trend\ GDPPI = trend\ Input\ Prices^{Economy} - trend\ TFP^{Economy}. \quad [4]$$

Substituting [4] into [3] implies that

$$trend\ Unit\ Cost^{Industry} = trend\ GDPPI - \left[\begin{array}{l} \left(trend\ TFP^{Industry} - trend\ TFP^{Economy}\right) \\ +\left(trend\ Input\ Prices^{Economy} - trend\ Input\ Prices^{Industry}\right) \end{array}\right] \quad [5]$$

If the GDP-PI is used as an inflation factor for the PCI, the bracketed expression corresponds to the X factor. This result shows that the X factor should be calibrated to reflect *differences* in the input price and TFP trends of the relevant utility industry and the economy. The productivity differential will be the difference between the TFP trends of the industry and the economy. X is more apt to be positive, slowing PCI growth, when industry TFP growth exceeds the economy-wide TFP growth embodied in the GDP-PI. The inflation differential is the difference between the input price trends of the economy and the industry. X will tend to be larger (smaller) when the input price inflation of the economy is more (less) rapid than that of the industry.

Q. PLEASE EXPLAIN WHY THE INPUT PRICE TRENDS OF THE ECONOMY AND THE GAS DISTRIBUTION INDUSTRY MIGHT DIFFER.

A. The input price trends of a utility industry and the economy can differ for several reasons. One reason is that certain input prices may grow at different rates in some regions than they do on average throughout the economy. It is also possible that the industry has a different mix of inputs than the economy, and there are differing inflation rates in prices for different inputs. This may be the case for gas distribution, since this industry is more capital intensive than the typical business in the economy. The gas distribution industry's input price index is therefore more sensitive to fluctuations in the cost of funds than is the input price index for the economy.

Q. TFP AND INPUT PRICE INDEXES FOR UTILITY INDUSTRIES ARE COMPUTED USING THE INDUSTRY'S OWN HISTORICAL DATA. IS THIS RELEVANT FOR SETTING THE TERMS OF A PRICE CAP INDEX?

A. Yes. Utility industries have historically been subject to rate of return regulation. Economists generally believe that rate of return regulation does not create optimal incentives to contain unit cost. Industry TFP and input price trends calculated from historical data will naturally reflect the industry's historical unit-cost performance.

PBR is designed to create stronger performance incentives than traditional regulation. In theory, superior incentives should lead, in turn, to more rapid TFP growth relative to historical norms. PBR plans typically incorporate consumer dividends to reflect the

expectation that TFP growth will increase under PBR, and consumer prices should reflect some of the benefits of this expected growth. Adding a consumer dividend to formula [5] yields the result

$$\begin{aligned} trend\ Unit\ Cost^{PBR} &= trend\ Unit\ Cost^{Industry} - CD \\ &= trend\ GDPPI - [(trend\ TFP^{Industry} - trend\ TFP^{Economy}) \\ &\quad + (trend\ Input\ Prices^{Economy} - trend\ Input\ Prices^{Industry}) - CD] \end{aligned} \qquad [6]$$

The bracketed term above is equivalent to the X factor that was in effect at the end of Boston Gas's previous PBR plan.

Q. ARE YOU SUGGESTING THAT A CONSUMER DIVIDEND IS AN APPROPRIATE PART OF EVERY PRICE-CAP INDEX?

A. No. The appropriate magnitude of a consumer dividend can vary by company. In principle, for some companies, the most appropriate value for a consumer dividend is zero.

Q. PLEASE EXPLAIN.

A. The appropriate values for consumer dividends depend on a number of inter-related factors. The first is the cost efficiency of the utility at the outset of the PBR plan. In theory, consumer dividends are designed to reflect productivity gains that occur when a utility responds to the stronger performance incentives under PBR. Companies that are relatively good cost performers at the beginning of a PBR plan will have less "fat" to cut and thereby less opportunity to improve their productivity performance. It is therefore appropriate to have lower consumer dividends for utilities that are relatively good cost performers at the outset of a PBR plan.

The second factor is whether the Company is subject to PBR for the first time. PBR is designed to strengthen performance incentives compared with traditional rate of return regulation. It is reasonable to believe that companies initially respond to PBR incentives with cost reduction initiatives that clip the "low hanging fruit," but it gets progressively harder to reduce costs over time. A company that is updating a PBR plan has already been subject to stronger performance incentives compared with traditional regulation. It is likely that such a company would have already undertaken the foremost cost-reduction

initiatives, so that there are fewer remaining opportunities to cut costs during the next PBR plan. Since there is less ability for incremental productivity enhancements in subsequent PBR plans, it is often appropriate to reduce the consumer dividend in updated PBR plans.

Third, consumer dividends may be related to the strength of the incentives created by the plan. PBR plans can be designed in many different ways, and these differences can affect the strength of incentives inherent in the plan.

The appropriate value of the consumer dividend also depends on other benefit-sharing provisions that may be contained in a PBR plan. For example, customers can benefit from increased earnings that are shared through an earnings sharing mechanism (ESM). Since the lack of an ESM or other benefit-sharing provisions places more weight on the consumer dividend as a channel for the customer benefit, it is appropriate for a PBR plan to have a smaller consumer dividend if it is paired with other benefit-sharing provisions like an ESM. In this case, Boston Gas is proposing to carry over the ESM structure incorporated by the Department in the Company's previous PBR plan.

III. TFP RESEARCH FOR THE GAS DISTRIBUTION INDUSTRY

Q. LET'S TURN NOW TO YOUR EMPIRICAL RESEARCH FOR BOSTON GAS. PLEASE START BY EXPLAINING THE CONCEPT OF A TFP INDEX.

A. A TFP index is the ratio of an output quantity index to an input quantity index.

$$TFP = \frac{Output\ Quantities}{Input\ Quantities}.$$

The output quantity index of an industry summarizes the amount of work that it performs. An industry's input quantity index summarizes the amount of production inputs it has used to perform this work.

A TFP trend index is the difference between the trends in the component output and input quantity indexes.

$$trendTFP = trendOutputQuantities - trendInputQuantities.$$

TFP thus grows when the output quantity index rises more rapidly (or falls less rapidly) than the input quantity index. TFP fluctuates from year to year but in most industries trends upward over time.

Q. WHAT CAUSES TFP GROWTH?

A. The sources of TFP growth are diverse. One source is technical change. New technologies permit an industry to produce given output quantities with fewer inputs. Economies of scale are a second source of TFP growth. Scale economies will exist when costs grow less rapidly than output, so that unit costs decline when output expands. The indexing logic outlined before shows that, for a given growth rate in input prices, unit-cost reductions are simultaneously reflected as TFP increases.

A third source of TFP growth is the elimination of "X inefficiencies." X inefficiencies refer to the extent of cost inefficiency within an enterprise, given the available technology. Firms increase their TFP growth by eliminating these inefficiencies. Therefore, firms have less ability to increase TFP growth in this manner as they become relatively *more* cost efficient.

A fourth determinant of TFP growth is the degree of capacity utilization. Suppliers in most industries find it uneconomical to match production capacity to demand fluctuations. TFP fluctuates with the level of capacity utilization.

Q. PLEASE DESCRIBE THE DATA USED IN YOUR INDEXING WORK FOR BOSTON GAS.

A. PEG gathered most of the data used in our indexing work directly from U.S. gas distributors. These data sources include Uniform Statistical Reports (USRs) and reports that many distributors file with their state regulators. Further details of our data sources are contained in the report *X-Factor Calibration for Boston Gas*, attached to this testimony as Exhibit KEDNE/LRK-2.

Q. PLEASE DISCUSS THE METHODS YOU EMPLOYED TO CONSTRUCT TFP INDEXES FROM THIS DATA.

A. The growth rate in the output quantity index was a weighted average of the growth rates in two subindexes: the number of customers served and total gas throughput. The weights were the shares of these subindexes in the sum of their estimated cost elasticities. The elasticity estimates were drawn from PEG's econometric cost research. This research is summarized in the report *The Cost Performance of Boston Gas*, attached to this testimony as Exhibit KEDNE/LRK-3.

The growth rate in each input quantity index was a weighted average of the growth rates in quantity subindexes for capital, labor, and non-labor operation and maintenance ("O&M") inputs. The weights were based on the shares of these input classes in the industry's total cost of gas distribution. The relevant costs comprised O&M expenses and the cost of capital.

The breakdown of capital cost into a capital price and a capital quantity is essential if we are to measure input price and productivity trends. The study used a service price approach to capital cost measurement. Under this approach, the cost of capital is the product of a capital quantity index and the price of capital services. This method has a solid basis in economic theory and is well established in the scholarly literature.

Q. HOW DID YOU DEFINE THE "GAS DISTRIBUTION INDUSTRY"?

A. The gas distribution industry was defined as an aggregate of 16 gas distributors in the Northeastern United States.

Q. WHY DID YOU FOCUS ON THE NORTHEAST?

A. Cost and demand pressures may differ regionally, which would affect both input and output growth. In addition, a Northeast standard for the gas distribution industry was accepted by the Department in the previous PBR plan for the Company. In accepting a

regional industry standard, the Department cited empirical evidence showing that there were different cost pressures in the Northeast.

Q. DID YOU FIND EVIDENCE OF DIFFERENT COST PRESSURES IN THE NORTHEAST?

A. Yes. Our econometric research developed a cost model that predicted costs for U.S. gas distributors given various factors beyond their control. Our results showed that, even when controlling for the higher costs of inputs in the Northeast and other important cost drivers, having a Northeast location was associated with a statistically significant increase in a gas distributor's expected costs. This supports the Department's previous finding that gas distributors in the Northeast face different cost pressures vis-à-vis distributors in other regions.

Q. PLEASE DISCUSS YOUR TFP RESULTS.

A. The annual growth trend in the TFP of our Northeast aggregate was 0.53% over the 1990-2000 period. Output quantity growth averaged 1.42% per annum over this period. This trend outpaced input quantity growth, which grew at an average annual rate of 0.89% over the 1990-2000 period.

IV. U.S. PRODUCTIVITY GROWTH

Q. WHAT IS THE BEST AVAILABLE MEASURE OF *ECONOMY-WIDE* TFP GROWTH?

A. The best available proxy for the TFP growth of the U.S. economy is the multifactor productivity ("MFP") index for the U.S. private business sector. This is calculated by the US Bureau of Labor Statistics (BLS). The BLS also calculates indexes of labor productivity growth. These are somewhat better known to the general public but are less relevant to the design of a price cap index.

Q. WHAT WAS THE TFP TREND FOR THE ECONOMY?

A. The MFP index for the U.S. private business sector grew by an average annual rate of 0.98% in the 1990-2000 period. This is nearly twice the rate of productivity growth for the Northeast gas distribution industry during this period. A productivity differential

based on the difference between the growth trends of the two productivity indexes would be -0.45%.

Q. YOUR EVIDENCE SUGGESTS THAT TFP FOR THE GAS DISTRIBUTION INDUSTRY IS GROWING LESS RAPIDLY THAN FOR THE US ECONOMY. IS IT UNUSUAL FOR SOME INDUSTRIES TO EXHIBIT LESS PRODUCTIVITY GROWTH THAN THE OVERALL ECONOMY?

A. No, it is not. The economy-wide TFP growth represents a weighted average of TFP growth rates for different economic sectors. Strictly as a mathematical matter, if some industries display more rapid TFP growth relative to the overall economy, then some sectors must exhibit less rapid TFP growth. A finding of a negative productivity differential for a specific industry, like gas distribution, is therefore not surprising.

Q. IS THERE EVIDENCE OF NEGATIVE PRODUCTIVITY DIFFERENTIALS FOR OTHER INDUSTRIES?

A. Yes. The BLS has produced estimates of productivity growth, over an almost identical period, for 108 US manufacturing industries.[1] These data show that there was a negative productivity differential between the US economy and 67 of these 108 industries. The largest such productivity differential, for drug manufacturing, was -4.2%. TFP evidence for different US industries therefore reveals that the -0.45% productivity differential for the gas distribution industry is neither unusual nor especially large relative to many other sectors of the US economy.

Q. HAS THE BLS UNDERTAKEN ANY OTHER ANALYSIS ON THE PRODUCTIVITY TREND OF THE US ECONOMY?

A. Yes. The BLS has analyzed its US productivity growth estimates and concluded that the economy's actual productivity trend is likely to be even *greater* than what is reported officially. One of the reasons the BLS believes the U.S. productivity trend is underestimated is the difficulty of measuring output in some service sectors. Although the BLS is careful not to quantify the exact amount of this bias, its research shows that

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[1] *Multifactor Productivity Measures for Three-Digit SIC Manufacturing Industries*, 1990-99, U.S. Department of Labor Bureau of Labor Statistics, Report 956, January 2002.

the actual annual growth in US MFP may be as much as 0.4% higher than the BLS estimates.

Q. HOW WOULD THIS BIAS AFFECT THE PRODUCTIVITY DIFFERENTIAL COMPONENT OF THE X FACTOR?

A. Assuming that U.S. MFP growth is actually underestimated, eliminating this bias would lead to a *more negative* productivity differential for the gas distribution industry. The reason is that removing this bias would tend to raise U.S. MFP growth but not affect the measured trend in gas distribution TFP. In light of this analysis from the BLS, I conclude that -0.45% is a conservative estimate of the productivity differential between the gas distribution industry and the economy and the differential may actually be greater (in absolute value terms).

V. INFLATION DIFFERENTIAL

Q. PLEASE DISCUSS YOUR METHOD FOR ESTIMATING INPUT PRICE TRENDS.

A. The growth rate in the input price index for Northeast gas distributors was computed as a weighted average of the growth rates in price subindexes for capital services, labor, and non-labor O&M inputs. The weights were based on the shares of these inputs in the industry's total cost of gas distribution.

Q. WHAT INFORMATION IS AVAILABLE ON THE INPUT PRICE TREND OF THE U.S. ECONOMY?

A. An input price index for the U.S. economy is not available from government sources. We constructed such an index using the indexing theory discussed above. It holds that, to the extent that the economy earns a competitive return, the long-run trend in its *input* prices is the sum of the trends in its *output* prices and its TFP. Using GDP-PI as an output price index and the MFP of the U.S. private business sector as a measure of the economy's TFP, we can then calculate the trend in the economy's input prices.

Q. PLEASE DISCUSS YOUR INPUT PRICE RESULTS.

A. Over the same 1990-2000 period used in our TFP work, our input price index for Northeastern gas distributors averaged 3.02% average annual growth. We find that over the same period, input prices in the U.S. economy grew at a 3.10% average annual rate. Thus the input price index for the economy grew 0.1% more rapidly, on average, than our input price index for Northeastern gas distributors.

Q. HOW DO THESE RESULTS COMPARE WITH THE COMPANY'S PREVIOUS PBR PLAN?

A. In the previous PBR plan, the Department approved an inflation differential of –0.1%. This was equal to the measured input price differential between the economy and the gas distribution industry.

Q. WHAT DO YOU RECOMMEND AS THE APPROPRIATE INFLATION DIFFERENTIAL FOR BOSTON GAS?

A. My research implies that the measured inflation differential between the US economy and the gas distribution industry over the 1990-2000 period is 0.1%. Although I performed a statistical test that showed this difference is not statistically significant, the Department used the actual measured differential when setting the X factor in the Company's last PBR plan. The inflation differential in that case was negative, which reduced the X factor and increased growth in the PCI, all else being equal. Here, the measured inflation differential is positive, which would raise the X factor and decrease growth in the PCI. In any event, the measured inflation differential is quite close to zero in both cases. Considering both the Department's precedent for Boston Gas and my current research, I believe the inflation differential in the Company's current PBR plan should be 0.1%.

VI. CONSUMER DIVIDEND

Q. WHAT WAS THE CONSUMER DIVIDEND IN BOSTON GAS'S PREVIOUS PBR PLAN?

A. The consumer dividend in the PBR plan that just expired for Boston Gas was 0.5%.

Q. WOULD IT BE APPROPRIATE TO INCREASE THE VALUE OF THE CONSUMER DIVIDEND IN A NEW PBR PLAN FOR BOSTON GAS?

A. No. A company that has previously been subject to PBR will likely have less ability to reduce costs, and thereby boost its productivity, than a company that was previously subject to cost of service regulation and is subject to PBR for the first time. In general, it becomes more difficult to make incremental cost reductions over time. In fact, in D.P.U. 96-50, the Department explicitly recognized that the Company was implementing a comprehensive reengineering initiative ("QUEST") that was projected to lead to productivity gains during the term of the first PBR Plan. The implementation of the QUEST plan was completed during the PBR term. The establishment of an equal or larger consumer dividend would imply a potential to achieve incremental productivity gains that are equal to or greater than the QUEST gains. I believe, to the contrary, that it will become *more* difficult to achieve incremental productivity gains in the Company's next PBR plan. Therefore, since Boston Gas has been subject to PBR in the past, during which time the Company completed a comprehensive reengineering effort, it is appropriate to reduce the consumer dividend in this plan from the 0.5% established in the Company's previous PBR plan.

Q. YOU PREVIOUSLY INDICATED THAT LOWER CONSUMER DIVIDENDS ARE WARRANTED FOR COMPANIES THAT ARE RELATIVELY GOOD COST PERFORMERS. DO YOU HAVE ANY EVIDENCE ON THE COST EFFICIENCY OF BOSTON GAS?

A. Yes. I have performed an econometric evaluation of the Company's cost performance over the period 1993-2000. This study is based on an econometric cost model that predicted the cost of providing gas distribution services given various factors beyond a company's control. These factors included the prices of production inputs, the amount of work performed (customers served and volumes delivered), the number of electric distribution customers served (for combination utilities), the percentage of mains that were made of cast iron, and dummy variables for distributors operating in the Northeast United States or serving a territory where there are frequent earthquakes. Our model estimated the impact of each of these "cost drivers" on a gas distributor's expected costs

using data from a national sample of 43 gas distributors from 1993 through 2000. I then inserted the actual values of each of these drivers for Boston Gas to generate a cost prediction for the Company over this period. The Company's actual costs of gas distribution were then compared to this prediction to assess its cost efficiency.

Based on this research, I found that Boston Gas costs were 27% below their predicted value, and this result was statistically significant. I have therefore concluded that Boston Gas is a significantly superior cost performer. Indeed, Boston Gas ranked second in our sample and is therefore one of the industry's very best cost performers. Lower consumer dividends are often warranted for the most efficient cost performers, so this analysis supports a reduction in the consumer dividend for the Company from its previous value of 0.5%.

Q. DID YOUR ECONOMETRIC STUDY DEVELOP ANY EVIDENCE ON HOW THE COMPANY'S PREVIOUS PBR PLAN AFFECTED THE COMPANY'S COST PERFORMANCE?

A. Yes. One other variable that we included in our cost model, in addition to the "cost drivers" listed above, was a dummy variable for the years when Boston Gas was subject to PBR. In our model, these were the four years between 1997 and 2000. The coefficient on this variable indicates how much the Company's costs were affected, on average, when it was subject to PBR after controlling for each of the other business conditions.

The coefficient for the PBR variable was –0.3%. This implies that, all else being equal, the Company's costs declined by an average of 0.3% during the years that it was subject to PBR, after controlling for the impact of other cost drivers. Therefore, it could be said that in the absence of PBR, Boston Gas's costs would have been 0.3% higher in 1997-2000.

Q. YOU PREVIOUSLY INDICATED THAT THE VALUE OF THE CONSUMER DIVIDEND MIGHT ALSO DEPEND ON OTHER BENEFIT-SHARING PROVISIONS IN A PBR PLAN. DOES THE COMPANY'S CURRENT PBR PROPOSAL CONTAIN ANY OTHER BENEFIT-SHARING PROVISIONS?

A. Yes. As is explained in the testimony of Mr. Bodanza, the Company's PBR proposal carries over the earnings-sharing mechanism developed and incorporated by the Department in the Company's previous PBR plan. The inclusion of an ESM in the Company's PBR proposal is a benefit that needs to be taken into consideration when setting the level of the consumer dividend.

Q. GIVEN ALL OF THESE FACTORS, WHAT IS THE MOST APPROPRIATE CONSUMER DIVIDEND IN AN UPDATED PBR PLAN FOR BOSTON GAS?

A. Our cost model indicates that PBR has reduced the Company's costs by 0.3% compared with what they would have been in the absence of PBR. This value reflects the best available evidence on how PBR affected the Company's cost performance in the previous PBR plan.

However, I believe at least three factors will make it difficult for the Company to match this performance in an updated PBR plan. First, this is the second PBR plan for Boston Gas coming seven years after the implementation of the first PBR term. The Company has realized the savings associated with all of the "low hanging fruit" in the first PBR plan, and it will likely become progressively harder to reduce costs in subsequent PBR plans. Second, Boston Gas is already a highly efficient cost performer. This means that the Company has relatively little "fat" to cut, whether or not the Company had been under PBR in the past. Third, the general economic outlook over the next five years is less certain than it was during the previous PBR plan. International conflicts, particularly in the Mideast, generally complicate the outlook for energy markets and energy-related businesses and may affect the Company's prospects for productivity growth more specifically.

In light of these factors, I believe that the 0.15% consumer dividend proposed in Mr. Bodanza's testimony is reasonable and reflects a realistic assessment of the level of

additional efficiencies available for the Company to capture during the period of its second PBR plan.

VII. CONCLUSION

Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS FOR AN X FACTOR FOR BOSTON GAS.

A. I believe an appropriate X factor in a new PBR plan for Boston Gas should be no greater than –0.2%. This overall X factor is comprised of a –0.45% productivity differential, a 0.1% inflation differential, and a 0.15% consumer dividend.

Q. WITH THIS X FACTOR, BOSTON GAS PRICES WOULD INCREASE A BIT MORE RAPIDLY THAN GDP-PI DURING THE TERM OF ITS PBR PLAN. IS IT UNUSUAL FOR PRICES IN AN INDUSTRY TO RISE MORE RAPIDLY THAN THE GDP-PI?

A. No. There is extensive evidence that, in our economy, some prices will rise more rapidly than GDP-PI and some will rise less rapidly than GDP-PI. As with the US. MFP trends previously discussed, economy-wide price trends reflect an average of divergent trends across different economic sectors. BLS data show that prices in some industries have recently grown much more rapidly than the GDP-PI. Just to take a few examples from the 1997-2001 period, when Boston Gas's PBR plan was in effect, prices for legal services, financial services, and funeral expenses rose at average annual rates of 4.9%, 3.9%, and 3.4%, respectively. The GDP-PI grew at an average rate of 1.79% per annum over this same period. This evidence demonstrates that the prices of services provided in some competitive markets have recently grown much more rapidly than the GDP-PI. Moreover, if the PCI for Boston Gas had contained an X factor of -0.2%, its prices would have grown by an average of 1.99% per annum over the 1997-2001 period, which is much slower than price inflation in each of the competitive industries listed above, as well as many other sectors of the U.S. economy.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.